Disparities in Smoking Between the Lesbian, Gay, and Bisexual Population and the General Population in California

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Objectives. We conducted a large, population-based study to assess tobacco use in California's lesbian, gay, and bisexual (LGB) population.

Methods. Standard measures of tobacco use from 2 separate, statewide household-based studies were used to compare basic prevalence rates in the LGB population and the general population in California. Data were derived from a 2003–2004 survey of LGB individuals living in California as well as from the 2002 version of the California Tobacco Survey, which gathered data on the state's general population.

Results. Smoking prevalence rates were higher in our sample of lesbians, bisexual women, and women who have sex with women than among women in the general California population. In the case of men, the only significant difference was that rates were higher among gay men than among men in the general population. Disparities in tobacco use between the LGB population and the general population were still evident after we controlled for key demographic variables and in comparisons with other tobacco use indicators such as average cigarette consumption.

Conclusions. Tobacco control efforts targeting the LGB population are needed to reduce this group's high rate of cigarette smoking. (*Am J Public Health.* 2007; 97:1496–1502. doi:10.2105/AJPH.2006.090258)

High rates of tobacco use have been found in the lesbian, gay, and bisexual (LGB) population of the United States.[1–10] Similar to other special populations such as racial/ethnic groups and communities of low socioeconomic status (SES), LGB individuals are targeted by tobacco companies,[11–16] and the high levels of daily stress (e.g., as a result of hiding their sexuality or their partner)[17] and other health disparities[18–21] they face increase their risk of tobacco use and tobacco-related problems. This situation is particularly worrisome given that the prevalence of HIV/AIDS, the symptoms of which are exacerbated by smoking, is higher among gays and bisexuals than among heterosexuals.[22–27]

In addition, some LGB subgroups are less likely than the general population to have access to or to use general medical facilities in which best practice cessation services are commonly used. There is, however, a lack of rigorous epidemiological data documenting disparities in health behaviors (as well as in illnesses and deaths) in the LGB population relative to the adult population in general.

Previous research on tobacco use in the LGB population has been limited by the use of nonrandom sampling methods, a lack of standard assessments of smoking and other tobacco use (current smoking, daily smoking, and average cigarette consumption), and a lack of consistent eligibility criteria. In an effort to minimize these limitations, the 2000 version of the California Health Interview Survey included a single item on sexual identity. Using data from this statewide random sample, Tang et al.[9] found that more than one quarter of self-identified lesbians currently smoked (25.3%; 95% confidence interval [CI]=19.5%, 31.0%), a rate that was about 70% higher than that observed among heterosexual women (14.9%; 95% CI=14.3%, 15.5%). They found that the smoking prevalence rate among self-identified gay men was 33.2% (95% CI=27.8%, 38.7%), which was 55.9% higher than the rate among heterosexual men.

Similarly, Greenwood et al. found that 31.4% (95% CI=28.6%, 34.3%) of urban men who have sex with men (MSM) were current smokers, as compared with 24.7% (95% CI=21.2%, 28.2%) of men in the general population.[7] Although our studies addressed some of the limitations just described, they were still limited in that sexual identity, rather than sexual behavior, was used to categorize the LGB population. In addition, neither study provided data on daily smoking, lifetime smoking, or amount of smoking.

We sought to estimate tobacco use prevalence rates in a probability sample of the California LGB population and compare key tobacco metrics between this population and California women and men of similar ages. At a minimum, collecting basic surveillance data from a large population-based sample of LGB individuals is necessary to more precisely assess tobacco indicators and rigorously compare these measures with data from the general population, setting the stage for ongoing monitoring and tracking of tobacco use in the LGB population over time.

METHODS

Overview

Between July 2003 and March 2004, we conducted a large-scale, population-based study of tobacco use in California's LGB population using a disproportionate, stratified random-digit-dialing sample design. We used standard measures from the California Tobacco Survey (CTS) to administer telephone interviews to a household population of 1950 LGB individuals (898 women and 1052 men). (The CTS, conducted by the California Tobacco Control Section with funding from the California Department of Health Services, is a large-scale telephone survey of the general population that also includes representative samples of racial/ethnic subgroups.) Using data from our LGB

sample and a general CTS sample (hereafter referred to as the California "general population" of adults aged 18 years or older), we compared measures of 4 basic indicators of tobacco use.

Design

A total of 187 000 telephone numbers were dialed using a 2-stage sampling approach; more than 31 000 households were successfully screened, and nearly 3000 of these screened households were identified as containing 1 or more eligible respondents. Individuals were eligible for the study if they self-identified as gay, lesbian, or bisexual or reported having engaged in same-gender sexual behavior after the age of 18 years. The final survey sample size was 1950 (a 66% completion rate). Upon completion of data collection, the data set was weighted to reflect the unequal probabilities of selection within the study strata.

Sample construction. We used a number of data sources (e.g., national surveys containing questions on sexual orientation or same-gender sexual behavior and US census same-gender domestic partner data) to estimate the size of California's overall LGB population and to map the areas where this population resided in the state. We identified 40 California zip codes as having the highest percentages of LGB residents and divided these zip codes into 2 strata. Stratum 1, the stratum of highest estimated prevalence, contained the 5 zip codes in and around the Castro district in San Francisco and the West Hollywood area in Southern California. Stratum 2 contained the balance of the zip codes. The initial estimates used in the sampling methodology were reasonably close to the actual rates found in the study.

The sample frame included telephone exchanges overlying the selected zip codes. We screened households by asking all adult household members whether they met the study inclusion criteria and whether any other adult household members met these criteria. If more than 1 person per household was identified as eligible, only 1 individual was randomly selected.

We asked the following of potential participants: "For this interview, we are interested in speaking with people who are not often studied in public health research—lesbians [gays] and bisexual women [men]. Would you fit into one of these groups?" We then asked "Regardless of whether a person thinks of herself [himself] as lesbian [gay], bisexual, or heterosexual, we are also interested in speaking with women [men] who had sex with women [men] since the age of 18. Do you fall into this category?"

Weighting procedures. Using data on actual LGB population prevalence rates, as well as information on the average numbers of LGB adults per household and 2000 census data on the numbers of households per stratum, we calculated final estimates of the size of the LGB female population and the LGB male population for each stratum. We then used these estimates to construct weights rectifying the unequal probabilities of selection across the sampling strata. Household-level weights were also based on the number of residential telephone numbers and the number of qualified respondents residing in the household.

Sexual orientation categories. The 898 women taking part in the study were divided into 3 groups: those who self-identified as lesbians, those who self-identified as bisexuals, and those who reported that they had sex with women but did not self-identify as lesbian or bisexual. The 1052 male participants were also divided into 3 groups: those who self-identified as gay, those who self-identified as bisexual, and those who reported that they had sex with men but did not self-identify as gay or bisexual.

Women were distributed relatively evenly between lesbians (n=307; 34.2%), bisexuals (n=263; 29.3%), and women who have sex with women (WSW; n=328; 36.5%). Conversely, men overwhelmingly identified themselves as gay (n=898; 85.4%) rather than as bisexual (n=74; 7.0%) or as MSM (n=80; 7.6%).

Measures

Tobacco use. A shortened version of the instrument used in the 2002 version of the CTS was used to assess standard indicators of tobacco use. Current smokers were defined as those who reported having smoked 100 or more cigarettes during their lifetime and who currently smoked every day or on some days. Average cigarette consumption was defined as follows: heavy daily smoking (25 or more cigarettes per day), moderate daily smoking (15–24 cigarettes per day), light daily smoking (less than 15 cigarettes per day), and light nondaily smoking (smoking on only some days, less than 15 cigarettes per day).

Demographic characteristics. Age was categorized into 1 of 4 groups (18–24 years, 25–44 years, 45–64 years, and 65 years or older). Educational level (highest grade or degree achieved) was classified as no formal education, elementary education (eighth grade or less), some high school, high school degree, some college, undergraduate degree, some graduate school, and graduate or advanced degree. Race/ethnicity was categorized as African American, Asian/Pacific Islander, Hispanic, non-Hispanic White, and other. Personal/household income levels were grouped into 4 categories (less than $30 000, $30 001–$50 000, $50 001–$75 000, and more than $75 000).

Data Analysis

We derived data on tobacco use prevalence rates from our survey of LGB individuals (n=1950). We compared rates of standard behavioral indicators of smoking and other tobacco use between our LGB population and the general population of California using data from the 2002 CTS (n=20 525). In addition, we examined outcomes stratified according to age, educational level, race/ethnicity, and income. All data were weighted.

We calculated point estimates and standard errors separately for our survey and the CTS using a Stata "svy" algorithm[28] that corrected standard errors for weighting and sample design. We were then able to use these values to compare independent means and proportions. For each demographic category within each gender, we performed 3 separate comparisons (lesbians, bisexual women, and WSW vs women in the general population, and gay men, bisexual men, and MSM vs men in the general population). A Bonferroni adjustment correcting for the increased likelihood of a type I error given the 3 comparisons yielded a critical significance value of .0167 (.05/3).

RESULTS

Sociodemographic Characteristics

In comparison with women in our LGB sample, women in the general population were significantly more likely to be 65 years or older. Fourteen percent of women in the general population were in this age group, as compared with 2.6% of lesbians ($P<.001$), 2.8% of bisexual women ($P<.001$), and 3.4% of WSW ($P<.001$) in our sample. Women in the general population (3.4%) were less likely than lesbians (25.6%; $P<.001$), bisexual women (13.6%; $P=.001$), and WSW (10.3%; $P=.007$) to have an advanced or graduate degree.

Twenty-nine percent of men in the general population self-identified as Hispanic, as compared with 10.4% of gay men ($P<.001$), 7.6% of bisexual men ($P<.001$), and 3.3% of MSM ($P<.001$). Significant differences in annual income were found only at the highest income level, with 43.0% of gay men and 31.4% of men in the general population reporting an income above $75 000 ($P=.001$).

Smoking Patterns in the Lesbian, Gay, and Bisexual and General Populations

Women in California's general population were less likely than women in our LGB sample to be daily or nondaily smokers (Table 1). Approximately 12% (95% CI=11.9%, 12.4%) of women in the general population were either daily or nondaily smokers, as compared with 28.8% (95% CI=21.1%, 38.0%) of lesbians ($P<.001$), 26.9% (95% CI=19.5%, 35.9%) of bisexual women ($P<.001$), and 43.6% (95% CI=35.9%, 51.5%) of WSW ($P<.001$).

In addition, a significantly greater percentage of women in the general population were categorized as never smokers (i.e., they had smoked fewer than 100 cigarettes in their lifetime). Sixty-eight percent (95% CI=67.4%, 68.7%) of women in the general population had never smoked, as compared with 43.0% (95% CI=34.0%, 52.5%) of lesbians ($P<.001$), 51.3% (95% CI=41.9%, 60.6%) of bisexual women ($P=.001$), and 21.5% (95% CI=16.0%, 28.3%) of WSW ($P<.001$). A higher percentage of WSW than women in the general population reported being former smokers (i.e., they had smoked 100 cigarettes or more in their lifetime but had not smoked at all during the past 30 days).

A total of 19.7% (95% CI=19.2%, 20.3%) of men in the general population were smokers, as compared with 27.3% (95% CI=21.6%, 33.8%) of gay men ($P<.016$) in our sample. No significant differences in smoking were observed in comparisons between men in the general population and bisexual men (30.3%; 95% CI=17.2%, 47.7%; $P=.186$) or MSM (33.2%; 95% CI=18.4%, 52.3%, $P=.133$). However, a significantly lower percentage of MSM than men in the general population had never smoked (Table 1).

Women in our sample were less likely to be light nondaily smokers and more likely to be light daily smokers than were women in the general population (Table 2). No significant differences were found in rates of moderate or heavy smoking. Differences among men paralleled those among women, but differences in rates of light daily smoking did not achieve statistical significance (Table 2).

Comparisons by Key Sociodemographic Factors

Significant differences in smoking prevalence rates among women were found when age, race/ethnicity, education, and income were controlled (Table 3). On the whole, smoking rates were higher among women in our sample than among women in the general population in every social stratum with the exceptions of women 65 years or older and women with no formal education. Analyses focusing specifically on age showed that, in the 18- to 24-year and 25- to 44-year age groups, smoking rates were higher in all 3 groups of women in our sample (lesbians, bisexuals, and WSW) than among women in the general population. In addition, the smoking prevalence among WSW aged 45–64 years was significantly higher than the prevalence among women in the same age group in the general population.

After we controlled for race/ethnicity, smoking prevalence rates among non-Hispanic White women in all 3 of our groups were higher than rates among women in the general population. Also, rates were higher

TABLE 1—Current Smoking Status Among Lesbians, Gay Men, WSW, MSM, Bisexuals, and the General Population: California, 2003–2004

	Lesbian or Gay, % (95% CI)	Bisexual, % (95% CI)	WSM or MSM, % (95% CI)	General Population, % (95% CI)
		Women		
Total	329	290	383	11 037
Smoking status				
Daily	22.2[a] (15.3, 31.2)	22.6[a] (15.7, 31.6)	29.7[a] (23.2, 37.2)	9.1 (8.8, 9.4)
Nondaily	6.5 (3.5, 11.8)	4.3 (2.1, 8.5)	13.8[a] (8.9, 20.9)	3.07 (2.9, 3.3)
Former[b]	28.3 (20.3, 37.8)	21.7 (15.2, 30.1)	34.9[a] (27.7, 42.9)	19.8 (19.1, 20.5)
Never[c]	43.0[a] (34.0, 52.5)	51.3[a] (41.9, 60.6)	21.5[a] (16.0, 28.3)	68.0 (67.4, 68.7)
		Men		
Total	548	85	83	9 488
Smoking status				
Daily	19.6 (14.7, 25.7)	16.2 (7.2, 32.4)	19.4 (8.5, 38.2)	13.9 (13.5, 14.3)
Nondaily	7.7 (4.9, 11.9)	14.1 (5.8, 30.4)	13.9 (4.9, 33.3)	5.8 (5.3, 6.3)
Former[b]	24.4 (19.2, 30.5)	34.2 (19.7, 52.4)	46.1 (29.5, 63.5)	27.0 (25.9, 28.1)
Never[c]	48.3 (41.3, 55.3)	35.5 (21.3, 52.7)	20.7[a] (9.5, 39.4)	53.3 (52.2, 54.4)

Note. CI = confidence interval; WSM = women who have sex with women; MSM = men who have sex with men.
[a]Statistically significant ($P<.017$) in test of independent proportions between subgroup and general population.
[b]Former smokers were defined as those who had smoked 100 cigarettes or more in their lifetime but had not smoked at all during the past 30 days.
[c]Never smokers were defined as those who had smoked fewer than 100 cigarettes in their lifetime.

TABLE 2—Cigarette Consumption Levels Among Lesbians, Gay Men, WSW, MSM, Bisexuals, and the General Population: California, 2003–2004

	Lesbian or Gay, % (95% CI)	Bisexual, % (95% CI)	WSW or MSM, % (95% CI)	General Population, % (95% CI)
		Women		
Total	329	290	383	11 037
Consumption category				
Heavy	14.8 (5.3, 34.7)	3.4 (0.5, 19.8)	4.8 (1.7, 12.5)	6.7 (5.6, 7.9)
Moderate	15.1 (6.2, 32.5)	16.5 (6.4, 36.5)	29.7 (20.1, 41.4)	28.1 (26.0, 30.2)
Light daily	70.1[a] (51.2, 84.0)	80.0[a] (60.4, 91.3)	64.5[a] (52.6, 74.9)	39.9 (37.5, 42.3)
Light nondaily	0.0	0.0	1.0[a] (0.1, 7.0)	25.3 (23.6, 27.0)
		Men		
Total	548	85	83	9 488
Consumption category				
Heavy	7.3 (3.3, 15.1)	13.7 (2.0, 55.5)	5.3 (0.7, 31.0)	9.1 (7.7, 10.5)
Moderate	19.1 (11.2, 30.5)	27.8 (9.3, 59.2)	41.8 (15.1, 74.5)	30.7 (28.4, 33.0)
Light daily	70.3[a] (58.2, 80.2)	58.5 (28.7, 83.1)	52.9 (22.5, 81.2)	30.7 (28.5, 32.9)
Light nondaily	3.4[a] (1.0, 11.1)	0.0	0.0	29.5 (27.4, 31.6)

Note. CI = confidence interval; WSM = women who have sex with women; MSM = men who have sex with men. Heavy daily smoking was defined as 25 or more cigarettes per day; moderate daily smoking was defined as 15–24 cigarettes per day; light daily smoking was defined as less than 15 cigarettes per day; and light nondaily smoking was defined as smoking on only some days and less than 15 cigarettes per day.
[a]Statistically significant ($P < .017$) in test of independent proportions between subgroup and general population.

among Asian/Pacific Islander WSW and WSW in the "other" race category than among women in the general population. No significant differences were found among Hispanic or African American women, although in both cases smoking rates among women in our sample were higher than those among women in the general population.

Differences in current smoking rates were apparent among women of low socioeconomic status (SES). Smoking rates were higher among women in our sample with less than a college education than among women in the general population at the same educational level. With the exception of an anomalous finding of a 52.9% smoking rate among WSW with graduate or advanced degrees, differences in smoking rates disappeared among women at this level of education. Similarly, women in our sample whose income was $30 000 or less were significantly more likely to be smokers than were women in the general population at the same income level. Smoking rates among women in our sample, particularly WSW, continued to be higher than rates among women in the general population at higher levels of income, but most of the differences did not achieve statistical significance.

Overall, smoking prevalence rates were higher among men in our sample than among men in the general population with the exceptions of Asian/Pacific Islanders and men with less than a high school education (Table 3). Although most differences did not achieve statistical significance, smoking rates in our 3 groups (gay men, bisexuals, and MSM) were higher than rates in the general population among men younger than 45 years, non-Hispanic Whites and Hispanics, men with either a high school education or an advanced degree, and men earning less than $30 000 or more than $75 000. Thus, smoking rates among men in our sample were higher than rates among men in the general population at both the low and the high ends of the SES spectrum, whereas rates were more comparable at moderate SES levels.

DISCUSSION

To our knowledge, this is the first statewide, household-based study of the LGB population (identified according to sexual orientation and same-gender sexual behavior) to assess all of the basic indicators of tobacco use in this priority group and compare these outcomes with those reported in the general population. Our results support those of earlier studies indicating that smoking prevalence rates are higher in the LGB population than in the general population.[2,7,29]

Our multiple comparisons of gays and lesbians, bisexuals, and MSM and WSW with men and women in the general population allowed us to explore which segments of the LGB community are particularly at risk. Significant differences in smoking rates were evident after control for key demographic variables (age, educational level, race/ethnicity, and income). However, it must be noted that lesbian and bisexual women distributed much more evenly into subgroups than did gay and bisexual men, so our lack of significant findings for the latter group may have been a function of poor statistical power. Significant differences in basic indicators such as daily cigarette smoking and average cigarette consumption were also found.

Findings from this study support efforts aimed at identifying tobacco disparities in terms of sexual orientation.[7,9,29] The high rates of cigarette smoking among members of the LGB population probably place them at increased risk for tobacco-related diseases (e.g., cancer, respiratory diseases, and cardiovascular diseases); moreover, comorbid conditions such as HIV/AIDS and depression are common among members of this group,[17,18,20,30,31] and the LGB population is one of the targets of the tobacco industry.[14,16]

If tobacco control efforts targeted toward the LGB population are to be effectively implemented and monitored, data on sexual orientation and same-gender sexual behavior must be gathered in local, state, and national behavioral surveys.[32] If such information were routinely collected in basic health surveys at every jurisdictional level, public health problems (e.g., smoking, depression, cancer, and heart disease) that might have different effects on sexual minority communities than on other groups could also be assessed, analyzed, and monitored.

Our estimates of smoking prevalence rates among lesbians, bisexual women, and WSW fell within the range of rates (10% to 43%)

TABLE 3—Percentages of Current Smokers Among Lesbians, Gay Men, WSW, MSM, Bisexuals, and the General Population, by Demographic Characteristics: California, 2003–2004

	Lesbian or Gay, % (95% CI)	Bisexual, % (95% CI)	WSW or MSM, % (95% CI)	General Population, % (95% CI)
		Women		
Total	329	290	383	11 037
Age, y				
18–24	73.5[a] (46.9, 89.7)	29.3 (16.7, 46.2)	52.9[a] (29.3, 75.2)	13.2 (12.1, 14.3)
25–44	28.9[a] (18.2, 42.6)	32.2[a] (21.0, 45.9)	42.8[a] (32.4, 53.8)	13.1 (12.2, 13.9)
45–64	19.7 (10.4, 34.1)	11.5 (3.8, 30.2)	41.5[a] (29.3, 54.9)	12.6 (11.8, 13.4)
≥65	0.9[a] (0.0, 8.1)	0.0	51.3 (15.9, 85.5)	7.2 (6.0, 8.5)
Race/ethnicity				
Hispanic	18.9 (6.9, 42.4)	9.2 (2.0, 33.9)	37.4 (14.1, 68.6)	7.5 (6.7, 8.4)
Non-Hispanic White	30.0[a] (20.9, 41.0)	28.9[a] (20.4, 39.2)	40.2 (32.0, 48.9)	7.5 (14.3, 15.7)
African American	36.9 (12.7, 70.0)	41.9 (13.0, 77.6)	40.78 (10.8, 79.6)	17.5 (15.7, 19.4)
Asian/Pacific Islander	31.0 (5.2, 78.6)	11.5 (2.6, 38.9)	68.5[a] (22.3, 94.3)	7.2 (5.4, 8.9)
Other	16.5 (3.7, 50.6)	16.9 (2.0, 66.7)	67.1[a] (42.6, 84.8)	21.3 (15.3, 27.3)
Education				
No formal education	0.0	0.0	0.0	3.8 (0.0, 9.0)
Less than high school	0.0	90.6[a] (40.8, 99.3)	100.0[a]	6.3 (4.4, 8.2)
High school	54.2[a] (29.9, 76.6)	42.0 (20.7, 66.7)	57.0[a] (41.0, 71.6)	16.5 (15.4, 17.6)
Some college	42.1[a] (26.9, 58.9)	33.8[a] (22.1, 47.7)	38.7[a] (27.5, 51.3)	14.8 (13.8, 15.7)
Undergraduate degree	10.0 (4.1, 22.1)	20.0 (8.9, 39.1)	35.0[a] (20.5, 52.9)	8.0 (6.9, 9.1)
Some postgraduate	25.2 (7.7, 57.7)	3.4 (0.7, 14.7)	10.2 (1.5, 44.7)	8.0 (5.6, 10.3)
Graduate or advanced degree	7.6 (2.4, 21.8)	4.6 (1.2, 16.6)	52.9[a] (29.3, 75.2)	4.9 (3.6, 6.3)
Income, $				
≤30 000	61.0[a] (42.2, 76.7)	38.5[a] (23.6, 55.9)	49.3[a] (36.4, 62.3)	12.7 (11.9, 13.5)
30 001–50 000	33.2 (14.8, 58.7)	22.2 (10.0, 42.5)	50.1[a] (33.4, 66.8)	16.1 (14.3, 17.8)
50 001–75 000	20.1 (8.5, 40.5)	39.8[a] (21.1, 62.0)	31.3 (15.9, 52.5)	11.6 (10.2, 13.1)
>75 000	12.6 (5.8, 25.4)	10.1 (4.1, 22.7)	33.8[a] (20.1, 50.9)	9.1 (8.3, 10.0)
		Men		
Total	548	85	83	9 488
Age, y				
18–24	34.9 (16.2, 59.8)	41.8 (15.5, 73.9)	100[a]	22.4 (20.7, 24.1)
25–44	29.6 (21.5, 39.3)	48.5 (20.8, 77.1)	33.6 (13.3, 62.7)	22.3 (21.2, 23.4)
45–64	24.4 (16.3, 34.9)	14.9 (3.4, 46.9)	40.0 (17.2, 68.1)	19.3 (17.7, 20.8)
≥65	12.8 (3.7, 35.7)	16.5 (2.1, 63.9)	0.0	7.4 (5.5, 9.3)
Race/ethnicity				
Hispanic	41.8 (21.3, 65.5)	45.8 (6.8, 90.7)	53.4 (11.0, 91.4)	20.1 (18.5, 21.7)
Non-Hispanic White	27.9[a] (21.6, 35.2)	22.8 (10.3, 43.1)	30.8 (14.6, 53.6)	19.2 (18.5, 20.0)
African American	17.8 (4.6, 49.1)	79.1[a] (34.8, 96.4)	21.7 (1.7, 81.6)	20.9 (18.7, 23.1)
Asian/Pacific Islander	11.9 (3.2, 35.9)	0.0	0.0	16.7 (14.0, 19.5)
Other	17.8 (4.2, 51.9)	97.1[a] (71.6, 99.8)	43.8 (11.5, 82.4)	33.5 (28.0, 38.9)
Education				
No formal education	0.0	0.0	0.0	10.9 (0.1, 21.6)
Less than high school	0.0	0.0	0.0	19.5 (16.2, 22.8)
High school	44.2 (25.8, 64.4)	37.1 (11.3, 73.2)	60.1 (27.8, 85.5)	28.6 (27.2, 29.9)
Some college	23.0 (14.6, 34.3)	30.2 (13.7, 54.1)	5.7[a] (1.4, 20.8)	19.9 (18.1, 21.8)
Undergraduate degree	28.6[a] (18.6, 41.2)	18.7 (3.4, 60.0)	10.6 (2.8, 32.3)	13.9 (12.4, 15.3)
Some postgraduate	28.5 (12.5, 52.9)	4.0 (0.5, 25.4)	19.4 (2.9, 66.4)	14.1 (9.7, 18.6)
Graduate or advanced degree	16.4 (9.2, 27.5)	40.7 (9.4, 82.0)	45.3 (12.7, 82.6)	7.4 (6.2, 8.6)

Continued

that have been reported in the literature.[1–10] In one of the most rigorous studies to date, Tang et al.[9] found that 25.3% of self-identified lesbians were smokers, whereas prevalence estimates in our study ranged from 26% to 44% depending on the subgroup. One of the most striking and noteworthy of our results was the 44% smoking rate observed among WSW (this is the first study of which we are aware to index rates of smoking in this group). In addition, the smoking rates observed for each of our age groups were higher than those reported by Gruskin et al.[2]

Our estimates of smoking rates among gay and bisexual men fell below the often-cited 47.8% estimate reported by Stall et al.[1] The most rigorous studies of smoking in the gay and bisexual population of men conducted to date showed that, overall, 31.4%[7] and 33.2%[9] of gay and bisexual men were smokers. In the present study, although smoking rates among MSM were comparable to rates found in previous investigations, poor statistical power probably contributed to the lack of significant differences between MSM and men in the general population. Still, we found significant differences in rates between men who self-identified as gay and men in the general population (27.3% vs 19.7%).

Strengths and Limitations

To our knowledge, this study is the first to move beyond simple reports of smoking by measuring and reporting standard indicators used in mainstream tobacco control efforts to monitor and track tobacco use and abuse. As mentioned, our results indicate that smoking rates are higher in the LGB population than in the general population. Moreover, our study is important in that it demonstrates that surveys should gather data on both same-gender sexual behavior and sexual identity for determining sexual orientation.

Some subsegments of the LGB population (e.g., men and women in low-density urban, suburban, and rural areas) were undersampled, which could have affected the smoking prevalence estimates reported here. Secular trends toward cessation during the 1990s, which resulted in lower smoking prevalence rates in the LGB population over time, may make it difficult to compare our data with data from earlier cross-sectional studies.[1,8,33]

TABLE 3—*Continued*

Income, $				
< 30 000	41.0 (27.0, 56.7)	53.2 (24.8, 79.6)	34.4 (12.8, 65.2)	23.9 (22.2, 25.6)
30 001–50 000	25.7 (12.0, 46.6)	16.9 (3.9, 50.9)	4.4 (1.0, 18.3)	20.8 (18.5, 23.0)
50 001–75 000	28.8 (17.0, 44.5)	20.0 (3.9, 60.5)	15.9 (3.2, 52.0)	20.7 (18.2, 23.1)
> 75 000	19.5 (12.8, 28.7)	49.6 (15.1, 84.4)	40.2 (15.0, 72.0)	14.0 (12.9, 15.1)

Note. CI = confidence interval; WSM = women who have sex with women; MSM = men who have sex with men.
[a]Statistically significant ($P < .017$) in test of independent proportions between subgroup and general population.

Conclusions

A basic foundation of state-based chronic disease surveillance programs is data collection, which allows for monitoring and tracking of key indicators to establish basic understanding of the problem; identify high-risk groups; inform policies, programs, and legislation; and justify and direct research and surveillance. Although both the general population and some key priority populations have benefited from such comprehensive targeting and monitoring, the LGB population has been largely ignored. Our study, however, is an important step toward collecting standard tobacco measures using sophisticated and rigorous epidemiological surveillance methodology commonly employed in mainstream tobacco control efforts.

Furthermore, as noted by Archer et al.,[29] tobacco use is just one of a cluster of comorbid health-related conditions that appear to be higher in the LGB population than in the general population. Such conditions, including depression,[18,19,21] substance abuse,[19,20,34] HIV/AIDS,[30] victimization,[35] and childhood trauma,[31] are known to not only coexist but also interact and amplify the effects of each other in a classic syndemic manner.[20] Reducing the prevalence of these co-occurring problems in the LGB population may result in a parallel decline in rates of tobacco use. At a minimum, it is important that those involved in national, state, and local tobacco control efforts work in partnership with the LGB population to take full advantage of current best practice models of tobacco control, including multilevel efforts designed to reduce tobacco-related morbidity and mortality.

Finally, it is important to identify other risk and protective factors associated with smoking and cessation in the LGB population. For example, tobacco use (and other health) disparities in the LGB population are probably related to high levels of societal discrimination and daily stress.[17,36] Research is needed to uncover the ways in which identity, SES, and other individual, interpersonal, social, and environmental factors contribute to smoking and smoking cessation. ■

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Contributors

E.P. Gruskin, G.L. Greenwood, and L.L. Bye designed the study, constructed the questionnaire, oversaw the fieldwork, and completed the data collection. E.P. Gruskin took the leadership role in designing and writing the article, leading the analysis team, and revising the final draft. G.L. Greenwood, M. Matevia, L.M. Pollack, and L.L. Bye participated in designing the analysis plan and in reviewing and writing the article. M. Matevia analyzed the data.

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Human Participant Protection

This study was approved by the Committee on Human Research, University of California, San Francisco, and Kaiser Permanente's institutional review board. Participants provided verbal informed consent.

References

1. Stall RD, Greenwood GL, Acree M, Paul J, Coates TJ. Cigarette smoking among gay and bisexual men. *Am J Public Health.* 1999;89:1875–1878.

2. Gruskin EP, Hart S, Gordon N, Ackerson L. Patterns of cigarette smoking and alcohol use among lesbians and bisexual women enrolled in a large health maintenance organization. *Am J Public Health.* 2001; 91:976–979.

3. Aaron DJ, Markovic N, Danielson ME, Honnold JA, Janosky JE, Schmidt NJ. Behavioral risk factors for disease and preventive health practices among lesbians. *Am J Public Health.* 2001;91:972–975.

4. Burgard SA, Cochran SD, Mays VM. Alcohol and tobacco use patterns among heterosexually and homosexually experienced California women. *Drug Alcohol Depend.* 2005;77:61–70.

5. Cochran SD, Mays VM, Bowen D, et al. Cancer-related risk indicators and preventive screening behaviors among lesbians and bisexual women. *Am J Public Health.* 2001;91:591–597.

6. Diamant AL, Wold C, Spritzer K, Gelberg L. Health behaviors, health status, and access to and use of health care: a population-based study of lesbian, bisexual, and heterosexual women. *Arch Fam Med.* 2000;9:1043–1051.

7. Greenwood GL, Paul JP, Pollack LM, et al. Tobacco use and cessation among a household-based sample of US urban men who have sex with men. *Am J Public Health.* 2005;95:145–151.

8. Skinner WF, Otis MD. Drug and alcohol use among lesbian and gay people in a southern U.S. sample: epidemiological, comparative, and methodological findings from the Trilogy Project. *J Homosex.* 1996; 30(3):59–92.

9. Tang H, Greenwood GL, Cowling DW, Lloyd JC, Roeseler AG, Bal DG. Cigarette smoking among lesbians, gays, and bisexuals: how serious a problem? *Cancer Causes Control.* 2004;15:797–803.

10. Valanis BG, Bowen DJ, Bassford T, Whitlock E, Charney P, Carter RA. Sexual orientation and health: comparisons in the Women's Health Initiative sample. *Arch Fam Med.* 2000;9:843–853.

11. Lipman J. Philip Morris to push brand in gay media. *Wall Street J.* August 13, 1992:81.

12. Goebel K. Lesbians and gays face tobacco targeting. *Tob Control.* 1994;3:65–67.

13. Elliot S. A campaign urges gay men and lesbians to resist tobacco ads. *New York Times.* June 4, 1997:D8.

14. Smith EA, Malone RE. The outing of Philip Morris: advertising tobacco to gay men. *Am J Public Health.* 2003;93:988–993.

15. Stevens P, Carlson LM, Hinman JM. An analysis of tobacco industry marketing to lesbian, gay, bisexual, and transgender (LGBT) populations: strategies for mainstream tobacco control and prevention. *Health Promotion Pract.* 2004;5(suppl 3):129S–134S.

16. Washington HA. Burning love: big tobacco takes aim at LGBT youths. *Am J Public Health.* 2002;92: 1086–1095.

17. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. *Psychol Bull.* 2003;129:674–697.

18. Mays VM, Cochran SD. Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *Am J Public Health.* 2001;91:1869–1876.

19. Cochran SD, Mays VM. Relation between psychiatric syndromes and behaviorally defined sexual orientation in a sample of the US population. *Am J Epidemiol.* 2000;151:516–523.

20. Stall R, Mills TC, Williamson J, et al. Association of co-occurring psychosocial health problems and increased vulnerability to HIV/AIDS among urban men who have sex with men. *Am J Public Health.* 2003;93: 939–942.

21. Mills TC, Paul J, Stall R, et al. Distress and depression in men who have sex with men: the Urban Men's Health Study. *Am J Psychiatry.* 2004;161:278–285.

22. Begtrup K, Melbye M, Biggar RJ, Goedert JJ, Knudsen K, Andersen PK. Progression to acquired immunodeficiency syndrome is influenced by CD4 T-lymphocyte count and time since seroconversion. *Am J Epidemiol.* 1997;145:629–635.

23. Cole E. HIV infection and stroke. *Stroke.* 2004; 35:51–56.

24. Craib KJ, Schechter MT, Montaner JS, et al. The effect of cigarette smoking on lymphocyte subsets and progression to AIDS in a cohort of homosexual men. *Clin Invest Med.* 1992;15:301–308.

25. Conley LJ, Bush TJ, Buchbinder SP, Penley KA, Judson FN, Holmberg SD. The association between cigarette smoking and selected HIV-related medical conditions. *AIDS.* 1996;10:1121–1126.

26. Galai N, Park LP, Wesch J, Visscher B, Riddler S, Margolick JB. Effect of smoking on the clinical progression of HIV-1 infection. *J Acquir Immune Defic Syndr Hum Retrovirol.* 1997;14:451–458.

27. Page-Shafer K, Delorenze GN, Satariano WA, Winkelstein W Jr. Comorbidity and survival in HIV-infected men in the San Francisco Men's Health Survey. *Ann Epidemiol.* 1996;6:420–430.

28. *Stata, Version 4.0* [computer program]. College Station, Tex: StataCorp; 1995.

29. Archer R, Hoff GL, Snook WD. Tobacco use and cessation among men who have sex with men. *Am J Public Health.* 2005;95:929.

30. Catania JA, Osmond D, Stall RD, et al. The continuing HIV epidemic among men who have sex with men. *Am J Public Health.* 2001;91:907–914.

31. Paul JP, Catania J, Pollack L, Stall R. Understanding childhood sexual abuse as a predictor of sexual risk-taking among men who have sex with men: the Urban Men's Health Study. *Child Abuse Negl.* 2001;25: 557–584.

32. Sell RL, Becker JB. Sexual orientation data collection and progress toward Healthy People 2010. *Am J Public Health.* 2001;91:876–882.

33. Skinner WF. The prevalence and demographic predictors of illicit and licit drug use among lesbians and gay men. *Am J Public Health.* 1994;84: 1307–1310.

34. Greenwood GL, White EW, Page-Shafer K, et al. Correlates of heavy substance use among young gay and bisexual men: the San Francisco Young Men's Health Study. *Drug Alcohol Depend.* 2001;61:105–112.

35. Greenwood GL, Relf MV, Huang B, Pollack LM, Canchola JA, Catania JA. Battering victimization among a probability-based sample of men who have sex with men. *Am J Public Health.* 2002;92:1964–1969.

36. Meyer IH. Minority stress and mental health in gay men. *J Health Soc Behav.* 1995;36:38–56.